CONTROL CIRCUIT FOR CONCURRENTLY MONITORING AND CONTROLLING FUNCTIONS AND FREQUENCY MODULATING STATUS INFORMATION IN A DIGITAL DATA NETWORK

Table of Contents

CROSS REFERENCES TO RELATED PATENT APPLICATIONS

U.S. Patent Application Ser. No. 855,181 filed Nov. 25, 1977 by Gueldenpfennig et al, titled "Digital Private Branch Exchange" and assigned to the assignee of this invention;

U.S. Patent Application Ser. No. 06/060,963 filed July 26, 1979 by Niertit et al, titled "Fully Electronic Telephone Network" and assigned to the assignee of this invention;

U.S. Patent Application Ser. No. 120,571 filed on even date herewith by Ronald W. Christain et al, titled "Multifunction Telephone with Message Information and Control Information Circuits for Connecting Stations and Common Equipment in a Telephone Network" and assigned to the same assignee as the present invention.

U.S. Patent Application Ser. No. 120,786 filed on even date herewith by Ronald W. Christain et al, titled "Telephone Network Including Common Equipment with Message Information and Control Information Circuits for Connecting to Stations Having Multifunction Telephones" and assigned to the same assignee as the present invention.

BACKGROUND OF THE INVENTION

This invention generally relates to digital data transmission systems and, more specifically, to the transmission of control data between different locations, for example to control multifunction telephones that are adapted for use in in private telephone networks.

Private telephone networks are generally used in corporations, institutions, and other organizations that require a number of telephones and a number of telephone trunks. There are two types of private telephone networks, each of which represents one application of this invention; they are: key telephone system networks and private branch exchange networks. Key telephone systems are usually used in small office systems whereas the private branch exchange is used in larger systems. Each type, however, has certain common characteristics and generic elements. For example, each type includes equipment at a central location that will perform some switching function for acoustic (e.g., voice) signals. U.S. Patent Application Ser. No. 855,181 discloses a private branch exchange that operates under the control of digital data processing equipment. This digital data processing equipment includes a central processor unit and memory units. The memory units store control information and control programs for enabling the central processor unit to operate the private branch exchange, especially basic call processing functions that include call switching. However, the use of digital data processing equipment as a control mechanism also enables a number of other functions to be performed easily and inexpensively.

Some examples of such functions include conference, "camp-on", call forwarding, and automatic calling functions. The conference function allows a first party to talk simultaneously with a second party and to add and drop third parties from the conversation. If the "camp on" function is available and the first party is talking with a second party when an incoming call is received from a third person, the "camp on" function places the incoming call into a hold condition. When the first and second parties complete their telephone conversation, the first party receives a signal indicating that an incoming call is on hold. The conversation can then begin. If a party in an office temporarily moves to another office, the call forwarding function enables the private branch exchange to automatically transfer all calls to another extension that is designated by the party. If a party dials a telephone number and that line is busy, the automatic calling function allows the number to be redialed merely by pushing a single button.

A number of existing private telephone networks perform one or more of the foregoing and other functions. Generally, a telephone in such a network is known as a multifunction telephone and includes a number of control, or function, pushbuttons on the telephone. Common equipment, including data processing equipment, polls the telephones in sequence by sending a message to the telephone and then receiving a message indicating that a button has been activated. The data processing equipment processes other information in conjunction with received messages to identify a specific function. Control programs in the data processing equipment define each function. This provides a very flexible private telephone network as it is merely necessary to change or add a control program to change or add a function. Thus, a standard mechanical configuration can provide a very flexible set of functions which a customer can then individually select for his particular application and needs.

In both key telephone systems and private branch exchange networks uninterrupted cables interconnect the common equipment at the central location and indi-